Geophysical Research Abstracts
Vol. 21, EGU2019-6763, 2019
EGU General Assembly 2019
© Author(s) 2019. CC Attribution 4.0 license.

Evaluation of the two operational dust models LOTOS-EUROS and ICON-ART for a frontal and a convective dust event in 2017

Thomas Kociok (1,3), Carmen Ullwer (1), Astrid Manders (2), Gregor Pante (3), Alexander van Eijk (1,2,4), Peter Knippertz (3), and Karin Stein (1)

(1) Fraunhofer IOSB, Department of Signatorics, Germany (thomas.kociok@iosb.fraunhofer.de), (2) TNO (Netherlands Organisation for Applied Scientific Research), The Hague, The Netherlands, (3) Institute of Meteorology and Climate Research (IMK), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, (4) LHEEA (UMR CNRS 6598), Ecole Centrale de Nantes, Nantes, France

High loads of mineral dust have a direct effect on daily life through their impact on visibility, health and material damage. In addition, atmospheric aerosols scatter and absorb solar radiation, which modifies the radiation budget of the atmosphere. As the concentration and composition of atmospheric aerosols exhibit strong spatio-temporal variations, there is a need for tools that quantify, characterize and possibly forecast the atmospheric aerosol loading on a relatively small scale.
In this contribution, a model-based investigation of the emission, transport and deposition of aerosols over the western Sahara is performed using the online coupled model ICON-ART and offline model LOTOS-EUROS driven by meteorological fields generated by the European Center for Medium-Range Weather Forecasts (ECMWF) or ICON. The latter allows a systematic analysis of dust behaviour in the two models due to identical meteorology. Longer-term simulations were performed for May and August 2017 with a grid spacing of 13 km on a domain covering the whole West African region. Additionally for two case studies embedded in this period, a frontal event over Morocco, Mauritania and Algeria and a convective event forming over the Aïr Mountains in Niger and affecting Mali, simulations were conducted as nested runs inside the parent domain to obtain a higher resolution on a grid of around 7 km. Tests with and without convective parametrization will be made. These two dust storms were chosen because of their stereotypical contrasting dynamical behaviour. The first frontal event took place between 07 and 10 May 2017 and generated an elongated gust front penetrating into Mauretania, Senegal and Guinea over the following few days. The second case happened in the first week of August 2017. Starting on 02 August in the afternoon as a small thunderstorm over the Aïr Mountains, a huge mesoscale convective system (MCS) formed, moved southwestward and generated a continuous outflow of cool air to the north. The model simulations were compared to station (AERONET and METAR) and satellite estimates of dust (e.g. RGB Dust Images from Spinning Enhanced Visible and InfraRed Imager (SEVIRI)).
First inspection of the LOTOS-EUROS simulations reveal a realistic representation of the frontal event but substantial problems with the MCS case with respect to timing, location, size and intensity. At the conference a systematic comparison of these findings with the corresponding ICON-ART simulations will be presented. A particular focus will be put on the role of convective parametrization on the MCS dust storm and systematic differences between the two dust schemes used in the models.